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EXAMINER	
RUSH, ERIC	
ART UNIT	**PAPER NUMBER**
2624	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	**Application No.** 10/567,221	**Applicant(s)** MOVASSAGHI ET AL.	
	Examiner ERIC RUSH	**Art Unit** 2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 September 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-5,7-10,12-15 and 17-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5,7-10,12-15 and 17-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *03 February 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 10/31/2008 has been entered.

Response to Amendment

2. This action is responsive to the amendments and remarks received on 9/10/2008. Claims 1 – 5, 7 – 10, 12 – 15 and 17 – 20 are currently pending.

Claim Rejections - 35 USC § 101

3. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 10, 12 - 15, and 17 - 19 are rejected under 35 U.S.C. 101 as not falling within one of the four statutory categories of invention. While the claim recites a series of steps or acts to be performed, a statutory "process" under 35 U.S.C. 101 must (1) be tied to another statutory category (such as a particular apparatus), or (2) transform underlying subject matter (such as an article or

material) to a different state or thing (Reference the May 15, 2008 memorandum issued by Deputy Commissioner for Patent Examining Policy, John J. Love, titled "Clarification of 'Processes' under 35 U.S.C. 101"). The instant claims neither transform underlying subject matter nor positively tie into another statutory category that accomplishes the claimed method steps, and therefore does not qualify as a statutory process.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claim 20 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. In the amendments entered 2/21/2008 new claim 20 has been entered to claim a computer readable storage medium. The Examiner can not find support for the computer readable storage medium comprising computer instructions in the original disclosure and as such the claim is rejected under 112 first paragraph as new matter.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

8. Claims 1 – 5, 7 – 10, 12 – 15 and 17 – 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kenneth R. Hoffmann, Andreas Wahle, Claire Pello-Barakat, Jack Sklansky & Milan Sonka, “Biplane X-ray Angiograms, Intravascular Ultrasound, and 3D Visualization of Coronary Vessels” International Journal of Cardiac imaging, Dordrecht, NL, Vol. 15 No. 6 Dec. 1999 Pertinent Pages 495 – 512 in view of Yoshigahara et al. U.S. Patent No. 7,015,951.

- With regards to claim 1, Hoffmann et al. teach a device for generating a three-dimensional model of a spatial structure comprising: an imaging unit for generating two-dimensional projection images of the structure from various directions; (Hoffman et al., Page 496 Column 1 Lines 4 - 8) a

display unit that is coupled to the imaging unit for displaying one of the projection images as a reference image, in which connection the display unit comprises input means in order to make possible the interactive specification of at least one image point of the structure as a reference point; (Hoffmann et al., Page 498 Column 1 Lines 25 - 42) a data processing device that is coupled to the imaging unit and the display unit and is designed to reconstruct a space point corresponding to the reference point of the structure from further projection images produced from other direction using the image-processing unit, (Hoffmann et al., Page 498 Column 2 Lines 27 - 35) wherein the space point is reconstructed by evaluating other image points of the further projection images that lie on a respective epipolar line of the reference point, (Hoffmann et al., Page 496 Column 2 Lines 12 - 19 and Lines 35 - 41, Page 497 Column 2 Lines 5 – 20 and Lines 30 – 49, and Page 498 Column 3 Lines 1 – 6 and Column 3 Line 20 – Column 4 Line 35) and wherein gray scale values corresponding to the other image points are projected on a projection line of the reference point and added to form a sum profile (Hoffmann et al., Fig. 3, Page 499 Column 2 Lines 7 – 18 and Page 496 Lines 26 - 35) and wherein said space point is defined as that position on the projection line of the reference point at which the sum profile assumes an extreme. (Hoffman et al., Fig. 3[right], Page 499 Column 1 Line 22 – Column 2 Line 18 and Page 500 Column 1 Line 8 –

Column 2 Line 26, Hoffman et al. use projections and epipolar lines to determine the space points of a vascular structure, as can be seen in the right portion of Fig. 3 the minimum values, extremes, of the sum profile are mapped to the vascular structure) Although it is believed that the teachings of Hoffmann et al. are sufficient to teach wherein said space point is defined as that position on the projection line of the reference point at which the sum profile assumes an extreme the Examiner draws attention to Yoshigahara et al. for a more detailed description of using epipolar lines and projections for using an extreme of the sum profile to define a space point. Yoshigahara et al. teach wherein said space point is defined as that position on the projection line of the reference point at which the sum profile assumes an extreme. (Yoshigahara et al., Figs. 3, 10, 12 and 13, Column 6 Lines 25 – 63, Column 9 Line 66 – Column 10 Line 17, Column 12 Lines 49 - 61) It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of Hoffmann et al. with the teachings of Yoshigahara et al. This modification would have been prompted in order to clarify the teachings of Hoffmann et al. and determine accurate positions of the space point by adding an interpolation process to determine distance information from a virtual viewpoint, this is especially beneficial in the construction and manipulation of 3D models.

- With regards to claim 2, Hoffmann et al. in view of Yoshigahara et al. teach a device as claimed in claim 1, wherein the imaging unit is a rotation X-ray unit. (Hoffmann et al., Page 496 Column 1 Lines 4 - 8)

- With regards to claim 3, Hoffmann et al. in view of Yoshigahara et al. teach a device as claimed in claim 1, wherein the data-processing device is designed to reconstruct said space point utilizing further projection images that are obtained during different cardiac phases. (Hoffmann et al., Page 503 Lines 31 - 40)

- With regards to claim 4, Hoffmann et al. in view of Yoshigahara et al. teach a device as claimed in claim 3, wherein the gray scale values are added punctiformly to form the sum profile. (Hoffmann et al., Fig. 3, Page 499 Column 2 Lines 7 – 18)

- With regards to claim 5, Hoffmann et al. in view of Yoshigahara et al. a device as claimed in claim 1, wherein the sum profile is only evaluated in a segment in which gray scale values of all the further projection images have contributed to the sum profile. (Hoffmann et al., Fig. 3, Page 499 Column 2 Lines 7 – 18)

- With regards to claim 7, Hoffmann et al. teach in view of Yoshigahara et al. a device as claimed in claim 1, wherein the spatial structure has a linear route and the data-processing device is designed to reconstruct said linear route from a specification of a plurality of reference points situated on the reference image. (Hoffmann et al., Fig. 3, Page 499 Column 1 Line 22 – Column 2 Line 18 and Page 500 Column 1 Line 8 – Column 2 Line 26, Page 498 Column 3 Lines 1 – 6 and Column 3 Line 20 – Column 4 Line 35)

- With regards to claim 8, Hoffmann et al. in view of Yoshigahara et al. teach a device as claimed in claim 1, wherein the data-processing device is designed to determine a width of the spatial structure from a projection of a reconstructed three-dimensional model on projection images of the spatial structure. (Hoffmann et al., Page 498 Column 2 Lines 27 – 35, Page 506 Column 1 Lines 1 – 6, and Page 508 Column 1 Lines 37 - 46)

- With regards to claim 9, Hoffmann et al. in view of Yoshigahara et al. teach a device as claimed in claim 1, further comprising: a cyclic movement detector for determining spontaneous movement associated with the spatial structure, (Hoffmann et al., Page 503 Column 2 Lines 6 – 40 and Page 504 “Extraction of the catheter path” section) wherein the data-processing device is designed to use only those further projection

images for the reconstruction of the space point that originate from the same phase of the spontaneous movement as the reference image. (Hoffmann et al., Page 503 Column 2 Lines 6 – 40 and Page 504 "Extraction of the catheter path" section)

- With regards to claim 10, Hoffmann et al. teach a method for generating a three-dimensional model of a spatial structure comprising the following steps: generating two-dimensional projection images of the structure taken from different directions, (Hoffman et al., Page 496 Column 1 Lines 4 - 8) the images comprising a reference image and further projection images; (Hoffmann et al., Page 498 Column 1 Lines 25 - 42) displaying the reference image; (Hoffmann et al., Page 498 Column 1 Lines 25 - 42) obtaining a selection of at least one image point on the reference image of the spatial structure as a reference point; (Hoffmann et al., Page 498 Column 2 Lines 27 - 35) determining a space point corresponding to the reference point of the spatial structure from the further projection images, wherein the space point is determined based on image intensity of other image points of the further projection images that lie on a respective epipolar line of the reference point, (Hoffmann et al., Fig. 3, Page 496 Column 2 Lines 12 - 19 and Lines 35 - 41, Page 497 Column 2 Lines 5 – 20 and Lines 30 – 49, Page 498 Column 3 Lines 1 – 6 and Column 3 Line 20 – Column 4 Line 35 and Page 499 Column 2 Lines 7 – 18) wherein

gray scale values corresponding to the other image points are projected on a projection line of the reference point and added to form a sum profile for determining the space point (Hoffmann et al., Fig. 3, Page 499 Column 2 Lines 7 – 18) and wherein the space point is defined as that position on the projection line of the reference point at which the sum profile assumes an extreme. (Hoffman et al., Fig. 3[right], Page 499 Column 1 Line 22 – Column 2 Line 18 and Page 500 Column 1 Line 8 – Column 2 Line 26, Hoffman et al. use projections and epipolar lines to determine the space points of a vascular structure, as can be seen in the right portion of Fig. 3 the minimum values, extremes, of the sum profile are mapped to the vascular structure) Although it is believed that the teachings of Hoffmann et al. are sufficient to teach wherein said space point is defined as that position on the projection line of the reference point at which the sum profile assumes an extreme the Examiner draws attention to Yoshigahara et al. in order to expedite prosecution and for a more detailed description of using epipolar lines and projections for using an extreme of the sum profile to define a space point. Yoshigahara et al. teach wherein said space point is defined as that position on the projection line of the reference point at which the sum profile assumes an extreme. (Yoshigahara et al., Figs. 3, 10, 12 and 13, Column 6 Lines 25 – 63, Column 9 Line 66 – Column 10 Line 17, Column 12 Lines 49 - 61) It would have been obvious to one of ordinary skill in the art at the time of the

invention to modify the teachings of Hoffmann et al. with the teachings of Yoshigahara et al. This modification would have been prompted in order to clarify the teachings of Hoffmann et al. and determine accurate positions of the space point by adding an interpolation process to determine distance information from a virtual viewpoint, this is especially beneficial in the construction and manipulation of 3D models.

- With regards to claim 12, Hoffmann et al. in view of Yoshigahara et al. teach the method of claim 10, further comprising obtaining the two-dimensional projection images using a rotation X-ray unit. (Hoffmann et al., Page 496 Column 1 Lines 4 - 8)

- With regards to claim 13, Hoffmann et al. in view of Yoshigahara et al. teach the method of claim 10, wherein the space point is reconstructed utilizing further projection images that are obtained during different cardiac phases. (Hoffmann et al., Page 503 Lines 31 - 40)

- With regards to claim 14, Hoffmann et al. in view of Yoshigahara et al. teach the method of claim 11, wherein the gray scale values are added punctiformly to form the sum profile. (Hoffmann et al., Fig. 3, Page 499 Column 2 Lines 7 – 18)

- With regards to claim 15, Hoffmann et al. in view of Yoshigahara et al. teach the method of claim 11, wherein the sum profile is only evaluated in a segment in which gray scale values of all the further projection images have contributed to the sum profile. (Hoffmann et al., Fig. 3, Page 499 Column 2 Lines 7 – 18)

- With regards to claim 17, Hoffmann et al. in view of Yoshigahara et al. teach the method of claim 11, wherein the spatial structure has a linear route and is reconstructed from a specification of a plurality of reference points situated on the reference image. (Hoffmann et al., Fig. 3, Page 499 Column 1 Line 22 – Column 2 Line 18 and Page 500 Column 1 Line 8 – Column 2 Line 26, Page 498 Column 3 Lines 1 – 6 and Column 3 Line 20 – Column 4 Line 35)

- With regards to claim 18, Hoffmann et al. teach the method of claim 11, further comprising determining a width of the spatial structure from a projection of a reconstructed three-dimensional model on projection images of the spatial structure. (Hoffmann et al., Page 498 Column 2 Lines 27 – 35, Page 506 Column 1 Lines 1 – 6, and Page 508 Column 1 Lines 37 - 46)

- With regards to claim 19, Hoffmann et al. in view of Yoshigahara et al. teach the method of claim 11, further comprising: determining spontaneous movement associated with the spatial structure using an electrocardiograph apparatus, (Hoffmann et al., Page 503 Column 2 Lines 6 – 40 and Page 504 “Extraction of the catheter path” section) and wherein only those further projection images are utilized for the reconstruction of the space point that originate from the same phase of the spontaneous movement as the reference image. (Hoffmann et al., Page 503 Column 2 Lines 6 – 40 and Page 504 “Extraction of the catheter path” section)

- With regards to claim 20, Hoffmann et al. teach a computer-readable storage medium comprising computer instructions for: (Hoffmann et al., Page 496 Column 1 Lines 5 – 29, specifically Lines 15 – 19) obtaining two-dimensional projection images of a spatial structure taken from different directions, (Hoffman et al., Page 496 Column 1 Lines 4 - 8) the images comprising a reference image and further projection images; (Hoffmann et al., Page 498 Column 1 Lines 25 - 42) displaying the reference image; (Hoffmann et al., Page 498 Column 1 Lines 25 - 42) obtaining a selection of a reference point on the reference image; (Hoffmann et al., Page 498 Column 2 Lines 27 - 35) determining epipolar lines for at least a portion of the further projection images, the epipolar

lines being based on the reference point; (Hoffmann et al., Page 496 Column 2 Lines 12 - 19 and Lines 35 - 41, Page 497 Column 2 Lines 5 – 20 and Lines 30 – 49, and Page 498 Column 3 Lines 1 – 6 and Column 3 Line 20 – Column 4 Line 35) determining image intensity of image points of the further projection images that lie on the epipolar lines; (Hoffmann et al., Fig. 3, Page 496 Column 2 Lines 12 - 19 and Lines 35 - 41, Page 497 Column 2 Lines 5 – 20 and Lines 30 – 49, Page 498 Column 3 Lines 1 – 6 and Column 3 Line 20 – Column 4 Line 35 and Page 499 Column 2 Lines 7 – 18) determining a space point corresponding to the reference point of the spatial structure from a summation of a least a portion of the image intensities, (Hoffmann et al., Fig. 3, Page 496 Column 2 Lines 12 - 19 and Lines 35 - 41, Page 497 Column 2 Lines 5 – 20 and Lines 30 – 49, Page 498 Column 3 Lines 1 – 6 and Column 3 Line 20 – Column 4 Line 35 and Page 499 Column 2 Lines 7 – 18) wherein the space point is defined as that position at which the summation assumes an extreme; (Hoffman et al., Fig. 3[right], Page 499 Column 1 Line 22 – Column 2 Line 18 and Page 500 Column 1 Line 8 – Column 2 Line 26, Hoffman et al. use projections and epipolar lines to determine the space points of a vascular structure, as can be seen in the right portion of Fig. 3 the minimum values, extremes, of the sum profile are mapped to the vascular structure) and generating a three-dimensional model of the spatial structure using the space point. (Hoffmann et al., Page 498 Column 2 Lines 27 – 35, Page

506 Column 1 Lines 1 – 6, and Page 508 Column 1 Lines 37 - 46) Although it is believed that the teachings of Hoffmann et al. are sufficient to teach wherein said space point is defined as that position on the projection line of the reference point at which the sum profile assumes an extreme the Examiner draws attention to Yoshigahara et al. in order to expedite prosecution and for a more detailed description of using epipolar lines and projections for using an extreme of the sum profile to define a space point. Yoshigahara et al. teach wherein said space point is defined as that position on the projection line of the reference point at which the sum profile assumes an extreme. (Yoshigahara et al., Figs. 3, 10, 12 and 13, Column 6 Lines 25 – 63, Column 9 Line 66 – Column 10 Line 17, Column 12 Lines 49 - 61) It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of Hoffmann et al. with the teachings of Yoshigahara et al. This modification would have been prompted in order to clarify the teachings of Hoffmann et al. and determine accurate positions of the space point by adding an interpolation process to determine distance information from a virtual viewpoint, this is especially beneficial in the construction and manipulation of 3D models.

Response to Arguments

9. Applicant's arguments with respect to claims 1, 10, and 20 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- Wink et al. U.S. Patent No. 7,180,976; which is directed towards a method of rotational angiography based hybrid 3-D reconstruction of coronary arterial structures.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ERIC RUSH whose telephone number is (571)270-3017. The examiner can normally be reached on 7:30AM - 5:00PM (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Bella can be reached on (571) 272-7778. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Matthew C Bella/
Supervisory Patent Examiner, Art Unit 2624

ER